

WASHINGTON DEPARTMENT OF ECOLOGY
ENVIRONMENTAL INVESTIGATIONS AND LABORATORY SERVICES

June 7, 1989

TO: Sandy Stephens, SWRO
FROM: Joe Joy, SWIS
SUBJECT: Review of Sampling Methodology for Port Ludlow

As you requested, I reviewed the document "Port Ludlow Water Quality Monitoring Program Proposed Sample Methodology - May 2, 1989." The methodology appeared to be complete, and I have only two comments to be addressed.

- 1) The sampling period within the tide cycle should be designated and should be consistent from sampling event to sampling event. I would suggest that the low slack period, or last half of ebb tide, be designated. The Port Ludlow samples in 1984 were collected on the last half of the ebb tide. This period is generally the most critical for water quality effects from the discharge.
- 2) The method outlined for 80 percent of the dissolved oxygen samples is not standard procedure. I am not confident that in productive Puget Sound waters the dissolved oxygen will remain stable even in the dark, on ice, and analyzed within four hours. They need to demonstrate to us that this method works by doing split samples and comparing Winkler to probe results. The other alternative would be to use a probe in situ.

I called Tom Smayda of Harper-Owes to obtain more details about the dissolved oxygen method. He agreed that the method described may have problems. Instead of storing the samples, they will analyze them onboard the boat immediately after drawing. This is acceptable modification to me.

If you or Tom have any questions about these comments, please call.

JJ:pb



Pope Resources
A Limited Partnership

60M Paradise Bay Rd.
Suite 4
Port Ludlow, Washington 98365
(206) 437-2101

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PORT LUDLOW
SEWER RESOURCES

May 17, 1989

Sandra Stephens
Department of Ecology
7272 Clean Water Lane
Olympia, WA. 98504-6811

RE: Ludlow Bay Water Quality - Proposed Sample Methodology

Dear Sandra:

Enclosed is the proposed sample methodology for water quality monitoring as required by our discharge permit # WA 002120-2. Review comments may be directed to either myself or Tom Smayda of Harper-Owes, 622-0812.

Also enclosed is a copy of "Declaration of Construction" for the wastewater plant and outfall as you requested.

Sincerely,

Larry Smith
Ludlow Sewer/Pope Resources

LS/srh

cc: Greg McCarry

Encl.

May 2, 1989

PORT LUDLOW WATER QUALITY MONITORING PROGRAM
PROPOSED SAMPLE METHODOLOGY

Described herein are proposed methods for sampling and analysis of Port Ludlow Bay Water in partial support of NPDES Permit No. WA - 002120-2, issued to Pope Resources. Parameter list, frequency and sample collection stations are detailed in the NPDES permit. Essentially, five bay stations plus sewage effluent will be sampled on six occasions between May and October, 1989.

1) Sample acquisition.

Two composite samples are to be collected from each station with a Niskin bottle or equivalent: 1) surface water is collected from depths of 1m, 3m and 5m, equal volumes are blended in a large bucket and then subsampled into the necessary bottles, and 2) deep water is similarly collected from 8m, 12m and 15m, except for Station 1, which has water collected from 10m, 20m, and 40m. Three prewashed and prelabeled nalgene bottles, a 250 ml and two 1 L are to be filled from each composite. Samples are to be stored on ice in a cooler for transport back to the laboratory. Upon return to the lab, the 250 ml sample from each composite is to be acidified with four drops of concentrated H_2SO_4 and deep frozen for subsequent total phosphorous analysis. One 1 L sample is used whole for fecal coliform, TKN and NH_4-N and 100 ml and 25 ml aliquots are filtered for $NO_3 + NO_2$ and Chl a analyses, respectively. The second 1 L sample is used for pH and total residual chlorine.

In addition, at each station, separate casts of the sample collection bottle shall be made to 3m and to 15m (40m at Station 1) for collecting dissolved oxygen (DO). DO samples are to be immediately and directly drawn into 300 ml BOD bottles (displacing 3 volumes of water). Twenty percent of the samples are preserved in the field with manganous sulfate and alkaline iodide solutions for subsequent Winkler titrations and 80 percent are untreated for determination with a dissolved oxygen meter. These samples are stored in the dark on ice until return to the onshore laboratory.

2) Field Data: Temperature, Salinity, Secchi depth.

The vertical distribution of temperature and salinity is to be determined at each station with an S-C-T meter (e.g. YSI model 33). The probe is lowered through the water column and temperature and salinity are to be recorded at 1m intervals from the surface (0 m) to the bottom. Secchi depth is to be measured on the shady side of the boat.

3) pH.

pH will be determined within four hours of sample collection. Because sea water is so well buffered, special care must be taken to measure pH.

Internationally accepted buffers will be used as reference points with a glass pH electrode and saturated calomel half-cell electrode. Determination will be made at laboratory temperature and pressure then in situ pH will be determined from knowledge of temperature and pressure at the sampling point.

4) Dissolved Oxygen.

The Winkler titration will be used for approximately 20 percent of collected samples as described in Strickland and Parsons (1972). Remaining DO samples will be determined with an electronic dissolved oxygen meter (e.g. YSI model 57). These analyses will be performed immediately upon return to the onshore laboratory and within four hours of sample collection.

5) Nutrients: $\text{NO}_3 + \text{NO}_2$, NH_4 , TKN, TP.

Nutrients will be determined by an independent testing lab. Samples for $\text{NO}_3 + \text{NO}_2 - \text{N}$ will be filtered within four hours of sample collection through prewashed 0.45 μ membrane filters; those for $\text{NH}_4 - \text{N}$ and TKN will be analyzed on unfiltered fractions. $\text{NO}_3 + \text{NO}_2 - \text{N}$ will be analyzed by an automated cadmium reduction method, $\text{NH}_4 - \text{N}$ by an automated phenate method and TKN by a micro-Kjeldahl method with phenate finish (APHA 1985). Samples will be deep frozen until analysis.

Total phosphorus will be assessed on unfiltered seawater samples following persulfate digestion by the ascorbic acid/molybdenum blue method (APHA 1985). Samples will be acidified to pH 1 with H_2SO_4 and deep frozen until analysis.

6) Fecal Coliform.

Fecal Coliform will be determined by the multiple tube fermentation technique by an independent testing laboratory and results will be presented in terms of Most Probable Number (MPN) (APHA 1985). This technique is chosen to provide

continuity with past sampling efforts. In addition, the onshore laboratory will perform fecal coliform analyses on identical samples by the membrane filter procedure (APHA 1985). If results are compatible, then the multiple tube fermentation technique will be discontinued.

7) Chlorophyll a.

Samples will be filtered for Chl a within four hours of collection. Following vigorous shaking of the seawater samples approximately 25 ml (as needed) will be filtered through 4.5 cm Gelman GF/C glass fiber filter paper and spiked with 1 ml of magnesium carbonate suspension. The magnesium carbonate suspension will be prepared by adding 1 g of finely powdered, reagent grade magnesium carbonate plus 3 g of reagent grade sodium chloride to 100 ml of distilled water in a stoppered flask. The filter paper will then be folded in half and stored loosely wrapped in tin foil in a desiccator and deep frozen until analyses. Chl a and phaeo-pigments will be analyzed by fluorometer as described by Holm-Hansen et al (1983).

8) Total Residual Chlorine.

Total residual chlorine is to be determined at the onshore laboratory by a DPD (N,N-diethyl-p-phenylene-diamine) colorimetric technique (APHA 1985).

9) Air Temperature, Wind Speed, Tide.

Air temperature and wind speed will be determined from instruments located at Port Ludlow Harbormaster Restaurant Lobby immediately prior to sample

collection. Tide conditions will be determined from a Seattle tide chart corrected for height by a ratio of 0.88 and corrected for time by subtracting 27 minutes to determine high tides and subtracting 18 minutes for low tides.

10) Quality Assurance/Quality Control.

Standard protocol for QA/QC will be observed. This includes but is not limited to:

- record keeping, including chain-of-custody.
- appropriate calibration and analytical procedures.
- appropriate bottle selection, holding times and conditions.
- accurate selection of sampling sites.
- precision assessed by duplication of 10% of the samples.

REFERENCES

APHA. 1985. Standard methods for the examination of water and wastewater. 16th Ed. American Public Health Association. 1268 pp.

Holm-Hansen, O. et al. 1965. J. Conseil, Conseil Perm. Intern. Exploration Mer. 30:3.

Strickland, J.D.H. & T.R. Parsons. 1972. A practical handbook of seawater analysis. Second Edition. Fish. Res. Bd. Can. Bull. 172. 310 pp.